

**WE CLAIM:**

1. A drive system for non-synchronous operation of a refrigeration compressor, comprising: a gas turbine adapted to drive the compressor; an electric motor with drive-through capability, electrically connected to an AC power grid and mechanically connected to the turbine and compressor and located between them on a common drive shaft and capable of starting the turbine and compressor from rest and bringing them up to operating rotational speed, said motor being adapted to also function as an AC generator for converting excess turbine mechanical power to electrical power; and a frequency converter connected between the motor and the power grid to condition the frequency in both directions (to the grid and from the grid) thereby allowing both non-synchronous operation and most efficient gas turbine operation.
2. The drive system of claim 1, wherein the frequency converter is a variable frequency drive.
3. The drive system of claim 2, wherein the variable frequency drive is of the pulse-width modulated type.
4. The drive system of claim 3, wherein the variable frequency drive is of modular design.
5. The drive system of claim 1, wherein the turbine is sized such that its rated power output is substantially equal to the power required to drive the compressor in expected average ambient temperature conditions.
6. The drive system of claim 1, wherein the electric motor is sized to produce sufficient power to supplement the power output of the turbine such that the compressor can be operated at desired rotational speed in hottest expected ambient temperature conditions.
7. The drive system of claim 1, wherein the refrigeration compressor is designed for use in a natural gas liquefaction plant.

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8. A method for operating a gas turbine powered refrigeration compressor for liquefying natural gas having an electric starter/helper motor/generator with drive-through capability located on a common drive shaft between the turbine and the compressor, and further having a frequency converter electrically connected between the electric motor/generator and an AC power grid, said method comprising the following steps:

(a) using the electric motor to bring the turbine and compressor up to operating rotational speed as the frequency of the AC power supplied to the motor from frequency converter is gradually brought up to compression string operating speed;

(b) supplying power from the turbine, supplemented as necessary by the electric motor, to spin the compressor at the rotational speed required for desired throughput, said turbine being operated substantially at its most efficient power output; and

(c) diverting any excess turbine power to the motor/generator operating in generator mode, then using the frequency converter to condition the frequency of the generator's AC output to that of the grid before delivery to the grid.

9. The method of claim 8, wherein the frequency converter is a variable frequency drive.

10. The method of claim 9, wherein the variable frequency drive is of the pulse-width modulated type.

11. The method of claim 10, wherein the variable frequency drive is of modular design.